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APPRAISAL REPORT  
NASHUA, NEW HAMPSHIRE  
MERRIMACK RIVER

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# Local Flood Protection

October 1986



US Army Corps  
of Engineers  
New England Division

APPRAISAL REPORT  
LOCAL FLOOD PROTECTION PROJECT  
NASHUA, NEW HAMPSHIRE

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## I. INTRODUCTION

### A. AUTHORITY

The city of Nashua, Rockingham County, New Hampshire is located on the Merrimack River at its confluence with the tributary, North Nashua River. The mouth of the Merrimack River is about 55 miles downstream of Nashua. Located at the confluence of the North Nashua and Merrimack Rivers is the Nashua Local Protection Project (LPP). The Nashua LPP is a unit in the comprehensive flood protection plan for the Merrimack River Basin authorized by the 1936 Flood Control Act and modified by the 1938 Flood Control Act.

Engineering Circular, EC 11-2-147 provides direction to review the adequacy of completed LPP's which were specifically authorized by Congress. Development in watershed areas and new information on basin hydrology since the project's construction may warrant an updated analysis of the degree of protection being realized. The objective is to determine whether it is advisable to modify the structure due to changes either in the area being protected or to make changes to the project to improve its viability, safety and reliability.

### B. PURPOSE AND SCOPE

The purpose of this investigation is to assess and document the adequacy of modifying the existing LPP on the Merrimack River through Nashua, New Hampshire, and determine if modifications are advisable and warrant further Federal study.

The scope of this particular report is of a reconnaissance nature. The objectives are:

- . Compile existing information
- . Initiate public involvement
- . Establish the need for modification
- . Identify modification opportunities
- . Determine preliminary feasibility of modifications
- . Recommend future course(s) of action

The study process is divided into two phases - reconnaissance and feasibility. In reconnaissance, modifications to the project are screened from the standpoints of economic, environmental and engineering integrity and safety considerations. The detail used is at the level of an initial appraisal investigation. Items of local cooperation, both past and future, are addressed when an affirmative action is recommended.

If warranted, the feasibility phase would detail the actual modification alternatives and recommend a particular course of action. The recommendation would be based on a comparison of each alternative's expected accomplishments.

### C. PUBLIC COORDINATION

The city of Nashua was notified by letter, dated 28 April 1986, of the New England Division's (NED) initiation of study efforts to review the existing LPP for the advisability of possible modifications.

On 8 May 1986, personnel from NED visited the project and protected area. Meetings were held with the city's Assistant Director of Planning and City Engineer to discuss the investigation and obtain their views. The Assistant Director of Planning did not foresee great possibilities for further development in the LPP area primarily because of traffic and access problems.

### D. OTHER STUDIES

(1) The most recent semi-annual inspection by Corps of Engineers, Operations Division personnel, was conducted on 8 May 1986. The project was determined to be in satisfactory condition. Deficient maintenance items noted during the inspection include:

- . Excessive amount of brush growth in the riprap dike area
- . Encroachment of the dike area north of the Cinder Road ramp area by Coating Systems, Inc. A portion of the dike had been disturbed.

(2) The Nashua LPP is operated by procedures established in the Operation and Maintenance Manual, dated March 1950, prepared by the Corps of Engineers.

(3) The Federal Emergency Management Agency's Flood Insurance Study for the city of Nashua became effective December 1978.

(4) The Resources, Merrimack River Basin for the New Hampshire and Massachusetts Region, dated September 1962, prepared by the Corps of Engineers.

## II. EXISTING CONDITIONS

### A. PROJECT HISTORY AND DESCRIPTION

#### 1. Construction

The existing project was built as a result of the disastrous floods of March 1936 and September 1938 along the Merrimack River Basin. The 1936 flood of record caused an estimated \$1.9 million in flood losses in Nashua, New Hampshire. The Nashua LPP was completed in 1949.

The LPP consists of the construction of a series of earth dikes and concrete cap walls to seal off a low area from river floods and a pumping system to dispose of storm water and sewerage from the drainage system in the protected area during periods of high river stages. The area protected consists of approximately seventy (70) acres of low lands that are occupied by the Boston & Maine Railroad and diversified industrial/commercial establishments and residences. The project's construction cost, including items of local cooperation (lands, easements, rights-of-way, etc.) was \$273,000 in 1946. By comparison, this same construction cost in today's dollars would be approximately \$2 million.

The Nashua LPP, also shown on Plate 1, mainly consists of dikes and walls, drainage system and electric power supply.

#### Dikes and Walls

The dikes and floodwall portion of the LPP consists of approximately 3,425 linear feet of earth dike and 205 linear feet of a concrete cap wall with a steel sheet piling cutoff, and 200 linear feet of concrete retaining wall abutments. The dike is constructed in two sections. The main dike is approximately 3,025 feet long and starts at the Boston and Maine Railroad bridge which spans the North Nashua River, and extends easterly along the bank of the North Nashua River to the Merrimack River and continues southerly along the west bank of the Merrimack to high ground just south of Crown Street. The dike embankment consists of compacted random and impervious material, constructed to elevation 122 feet NGVD, with a top width of 10 feet, a one on two (1 on 2) slope on the land side and a one on two and half (1. on 2.5) slope on the river side. The entire dike embankment, except where riprap is placed, is covered with a six (6) inch layer of seeded topsoil. A sand and gravel toe drain is provided at the toe of the slope on the land side for protection against seepage. The height of the main dike averages about eight to ten feet with a maximum height of approximately 16 feet.

The second dike section, about 400 feet long and located on the south end of the site, is approximately 600 feet south of the main dike. The second dike section is similar to the main dike except that a toe drain is not provided and it is only five (5) feet high. Due to space limitations adjacent to a storage warehouse along the bank of the North Nashua River, a concrete cap

wall is provided in lieu of the dike. The earth dike is terminated at both sides of East Hollis Street by concrete retaining walls which extend to and connect with the railroad bridges. Under extreme flood stages (118.9 feet NGVD) a low sand-bag dike across the railroad tracks is required at the northerly and southerly ends of the project for complete protection.

### Pumping Station

All sewerage and drainage from the area, except that diverted by present city overflow outlets, discharges by gravity through a conduit in the pumping station to the fifty-four (54) inch outfall. During flood stages, the discharge through the existing gravity conduit is diverted through a pumping station by means of control gates and the sewerage and drainage are pumped into the river against the head produced by the flood stage. A cross-sectional view of the dike at the pumping station is shown on Plate 2. The pumping station consists of a slate roofed, brick superstructure constructed on a reinforced concrete foundation. It houses two electrically driven 30-inch propeller pumps, one electrically driven 12-inch volute pump and control equipment. The total pumping capacity of all three pumps is 29,500 gpm against a total head of 19 feet. An emergency basin is provided to store sewerage and drainage in the event that the pumps should fail to start or to function properly.

### Drainage Work

A total area of 615 acres, roughly 2 miles by 1,500 to 3,000 feet, drains to the Nashua Pumping Station. The area extends through the industrial and business sections of the city. The outlying portions include residential developments. The existing storm and sanitary sewer system has been modified so that the system can properly function during flood periods. These modifications have included the construction of an outlet structure, manholes over existing mains, installing bypasses and abandoning sections of pipe lines no longer needed. The discharge ends of the abandoned sewers have been bricked up.

### Electric Power Supply

The pumping station is served from the Nashua Substation of the Public Service Company of New Hampshire by two 2400/4160 volt, 3 phase, 4-wire overhead circuits. A transformer substation was erected as a part of the pumping station project for stepping down the voltage to 480 volts. Switching facilities has been provided at the transformer substation for transferring the pumping station load from one to the other of the two incoming lines in case of failure of one power source.

## 2. Modifications

Within the past few years a sewerage treatment system has been built in Nashua in which 100 percent of all flows from the combined sewer/drainage system are intercepted and conveyed to the sewerage treatment plant then discharged to the river. During intense storm runoff the detention time that

the combined sewer/drainage flow goes through the treatment plant is reduced. The interception of storm and sanitary sewer by the sewerage treatment system, has reduced the Nashua LPP pumping station load in removing interior drainage from the protected area.

The retention basin alongside of the pumping station has been relocated and enlarged. The relocation was due to the enlargement of the Bridge Street bridge in 1975.

### 3. Damages Prevented

Flood damages prevented at Nashua are determined by comparison of the actual observed flow, with the existing upstream reservoir systems in place, to the calculated natural flow that would have occurred without the reservoirs. The 1936 flood of record caused an estimated \$1.9 million in flood losses. Since the completion of the Nashua LPP, in 1949, approximately \$107,100 in flood damages have been prevented. The majority of flood damage reduction in the LPP area is attributed to the five flood control reservoirs that have been completed in the Merrimack basin upstream of Nashua. The first reservoir was completed in 1943 with the last operational in 1962. Locations of the reservoirs are shown on the basin map, Plate 3.

Drainage areas of the Merrimack River at the Lowell, Massachusetts U.S.G.S. gage and at Nashua, New Hampshire are 4,635 and 3,982 square miles, respectively. Peak flows at Nashua are generally in the order of 5 percent less than those measured by the Lowell gage. The greatest flow experienced since the Nashua LPP was built occurred in April 1960, when the flow was approximately 79,000 cubic feet per second (cfs). The following table shows historic flood discharges of the Merrimack River at Nashua:

TABLE 1  
Historic Flood Discharges  
Merrimack River, Nashua, New Hampshire

DATE	PEAK DISCHARGES (ESTIMATED)	
	NATURAL	MODIFIED
March 1936	164,000	
September 1938	115,000	
April 1852	103,000	
April 1960		75,000 *
April 1984		57,000 **

\* Experienced as modified by MacDowell, Blackwater and Franklin Falls reservoirs

\*\* Experienced as modified by current system of reservoirs



The Nashua LPP was originally designed to provide protection against a recurrence of the maximum flood of record, as reduced by reservoirs completed prior to 1946 (Blackwater and Franklin Falls Reservoirs). The March 1936 flood, the maximum record flood for the entire Merrimack River, had a peak flow of approximately 164,000 cfs at Nashua, which greatly exceeded all discharges of record for the Merrimack River at this site.

#### 4. Level of Protection

The Nashua LPP provides protection against flood stages on the Merrimack and North Nashua Rivers. The project was originally designed to provide 3.5 feet of freeboard above a recurring March 1936 flood of record of 118.5 feet NGVD (120,000 cfs). Interior drainage was designed for a runoff rate of 0.2 inch per square foot (120 cfs) from an interior drainage area of 615 acres.

Since the completion of the Nashua LPP, the Corps of Engineers has constructed additional upstream reservoir projects, MacDowell and Hopkinton-Everett, which would further decrease flood stages at Nashua. A recurring March 1936 flood of record on the Merrimack River at Nashua, as modified by the existing reservoir system, would have a peak discharge of about 110,000 cfs. The flood elevation created by the modified flow would be about 116.7 feet NGVD, 5.3 feet below the top of protection and 1.8 feet below project design flood level. The annual probability of the March 1936 flood has been estimated as in the range of 1.0 to 0.5 percent (100-200 years). The project design flood of 120,000 cfs has an estimated annual probability of occurrence, with the existing system of reservoirs, of about 0.5 percent (200 years).

The Standard Project Flood (SPF) is the flood resulting from the most severe rainfall conditions reasonable characteristic of the region. Estimated SPF discharges for the Merrimack River at the Hudson-Nashua bridge in Nashua, both natural and as modified by existing reservoirs, are listed in Table 2.

TABLE 2

Standard Project Flood  
Merrimack River, Nashua, New Hampshire

	<u>NATURAL</u>	<u>MODIFIED BY RESERVOIRS</u>
DISCHARGE (CFS)	223,000	142,000
SPF FLOOD ELEVATION (NGVD)	134.2	122.5
TOP OF NASHUA LPP (NGVD)	122.0	122.0

The natural peak discharge of the estimated SPF is 223,000 cfs, which is 26 percent greater than the record flood of March 1936. The annual probability of the SPF has been estimated as in the range of 0.5 to 0.2 percent (200-500 years). With the current system of reservoirs, the modified SPF discharge

would be an estimated 142,000 cfs, with a resulting elevation of about 122.5 feet NGVD at the Nashua-Hudson bridge. To provide 3 feet of freeboard above such a flood, the existing LPP would have to be raised 3.5 feet, or 125.5 feet NGVD.

## 5. Recent Inspections

For the most part, the Nashua LPP is in good condition. The last semi-annual inspection was conducted on May 8, 1986 and found the project satisfactory. A copy of the inspection report is included in the Appendix. A few minor items were identified as needing attention, but the project's integrity is not threatened.

## B. PROJECT AREA

### 1. Description

The area protected by the Nashua LPP consists of approximately seventy (70) acres of low lands that are occupied by commercial/industrial establishments, residences and the Boston and Maine Railroad. The industries in the area include manufacturing plants concerned chiefly in the production of construction products. An important junction of the Boston and Maine Railroad system is located in Nashua. The LPP protects main line tracks, spur tracks and storage yards. Our investigation indicates that the industrial growth in the area during the past decades has slowed down.

Many of the residences in the area are well maintained. The maintenance of residences in the protected area generally indicates that the owners feel reasonably secure that their properties are protected from flooding.

### 2. Hydrology and Hydraulics

Historic floods on the Merrimack River date back to 1875. In recent years four floods of major proportion were experienced in various parts of the Merrimack River Basin. Two of these, November 1927 and September 1938, were associated with very intense rainfall; the March 1936 record event resulted from heavy rains in combination with snowmelt; a major flood in April 1960 was the result of basin snowmelt with moderate rainfall.

Discharge-frequency curves for the Merrimack River at Nashua are shown on Plate 4. These curves represent natural and modified peak flow frequencies. The frequency analyses were made in accordance with procedures outlined in EM 1110-2-1450 and "Guidelines for Determining Flood Flow Frequency," which utilizes Log Pearson Type III distribution as the base method. In addition, a stage-discharge rating curve and a stage-frequency curve have been developed for the Merrimack River at the Nashua-Hudson bridge and Route 111 bridge, as shown on Plates 5 and 6, respectively.

Since the great floods of March 1936 and September 1938, NED has constructed a system of four flood control reservoirs in the Merrimack River basin. Typical modifications provided by these reservoirs at Nashua are illustrated by the natural and modified discharge-frequency curves shown on Plate 4. It

is cautioned that for every occurrence of a certain frequency flood the reduction will not be exactly as indicated by the modified frequency curve. The magnitude of reduction will vary depending on the storm's orientation with respect to the upstream reservoirs.

A "project flood," which is identical in nature to the SPF, was included in the 1947 Report to the States. This synthetic flood is derived from a storm "which would be exceeded only on rare occasions," and which incorporates the outstanding characteristics of the great storms of record over and in the vicinity of the basin. At the Nashua LPP, natural discharge for this rare event would be 142,000 cfs resulting in a flood elevation of 122.5 feet NGVD. Profiles of various flows in the Merrimack River developed for the Federal flood insurance program in the vicinity of the LPP is shown on Plates 7 and 8.

### III. FUTURE CONDITIONS

#### A. LAND USE

##### 1. Community Plans

A meeting with Ms. Terry Szocd, the city's Assistant Director of Planning, was held to discuss the future plans for the area being protected by the project. Ms. Szocd did not foresee great possibilities for development in the LPP area, primarily because of traffic and access problems. She sees changes in occupants but essentially the same type of land use to continue and density in the future. Although there are residential and commercial properties in the area, it is classified (primarily zoned) for light industrial use.

Based on the same level of development that existed in 1936, a recurrence of a flood of the magnitude of the March 1936 event, with no LPP or reservoir system in place would result in flood losses of over \$1.9 million in the areas now protected by the Nashua LPP. The floodwaters would reach elevation 127.0 feet NGVD. However, under existing conditions, the reservoir system reduces the stage to elevation 116.7 feet NGVD - completely eliminating any losses from a flood of the magnitude of the March 1936 event.

#### B. PROJECT INTEGRITY

The Nashua LPP has performed the intended purpose to date. However, the semi-annual inspections have identified a number of minor deficient items that need to be addressed to ensure the project's continued performance. The wall and dike structures themselves are sound, and given proper maintenance should provide the intended protection well into the future.

The Nashua LPP now provides a higher level of protection than its original design due to the construction of a comprehensive reservoir system in the upper reaches of the Merrimack River Basin. It follows then that the city of Nashua would be subject to fewer flood events and the LPP would be pressed into service less often. If proper operation and maintenance is accomplished, the project's integrity should not be diminished or threatened.

#### IV. CURRENT PLANNING AND DESIGN CRITERIA

##### A. FREEBOARD

###### 1. Requirements

There are no specified criteria with regard to the design level of protection for flood damage reduction projects. Each project should be complete-within-itself and provide the maximum net benefits, unless there is overwhelming justification to deviate. In urban areas the SPF is a design goal since potential overtopping or failure could be catastrophic.

The freeboard of a channel is the vertical distance measured from the design water surface to the top of the channel wall or levee. Freeboard is provided to ensure that the desired degree of protection will not be reduced by unaccounted factors. Engineering regulations call for freeboard allowances above design grade of 2 feet for concrete walls and 3 feet for earth dike or levee systems. With the existing system of reservoirs in the Merrimack River Basin, the Nashua LPP exceeds this criteria - given that its original design was to protect from a recurrence of the March 1936 flood of record. The level of protection now afforded by the project, to the top of wall (elevation 122.0 feet NGVD), approaches an event having a 0.2 percent chance of annual occurrence or a 500-year flood.

Current planning guidance allows for a project being given credit for expected benefits within the bottom half of the freeboard range. In the case of the Nashua LPP, this is not applicable since the elevation of the mid-point of the current freeboard is above the elevation where benefits were credited to when the project was originally planned.

###### 2. Economics

EM 1120-2-104 outlines the procedure regarding benefits for advance replacement of existing projects. A credit can be taken when extending the life of a project and realizing benefits beyond which the project would have continued to function. Since the Nashua LPP is over 40 years old and near the end of its economic life, any modification that extends its physical life may take advance replacement benefits. However, an engineering analysis of the structure's stability and integrity would have to be accomplished to determine just how much longer the LPP can perform its intended purpose since advance replacement benefits can only be attributed for the period of time after that. This study does not address this issue.

The Merrimack River Basin study, completed in 1962, identified potential flood related losses among land use categories. The land use categories of the area protected by the Nashua LPP were in the following percentages: residential (26 percent), industrial/commercial (67 percent), public (4 percent), railroad (3 percent). Therefore, the land use mix was roughly two-thirds industrial/commercial and one-third residential.

In the intervening 38 years since the completion of the Nashua LPP, the area has maintained an almost equal mix of industrial/commercial and residential properties. However, land use has moved from industrial use to lighter manufacturing and commercial use.

## V. MODIFICATION OPPORTUNITIES

### A. LEVEL OF PROTECTION

Opportunities to increase the level of protection of the Nashua LPP are limited. From an economic standpoint, development in the area has remained about the same.

Previous discussion reflected the ability of the project with regard to the existing design grade. A recurring March 1936 flood of record on the Merrimack River at the Nashua-Hudson bridge, as modified by the existing reservoir system, would have a flood elevation of about 116.7 feet NGVD, 5.3 feet below top of protection and 1.8-foot below design level of protection flood level. Since the project now actually provides protection to an event rarer than originally intended, raising the height of the floodwall is unnecessary.

### B. PROTECTED AREA

Inspection of the areas downstream and upstream of the LPP indicated extension of the existing measures are not needed at this time. The Merrimack River's banks at these locations are substantially higher than potential flood stages and only a few structures would be provided new flood protection.

### C. PROJECT FEATURES

Items noted as being deficient in the recent inspection should be attended to for assurance of project purpose.

## VI. CONCLUSIONS

The LPP is in good condition and expected to continue to perform its intended purpose. It is currently capable of providing protection against an event having an annual chance of occurrence slightly greater than 0.5 percent, or one having a recurrence interval of just over 200 years. There is about 5.3 feet of freeboard above the design level - the March 1936 flood of record. At the present time, no additional modifications to the Nashua LPP are found to be necessary.



## VII. RECOMMENDATIONS

Modifications to increase the level or extent of flood protection at the Nashua LPP are not recommended at this time. However, due to the project's age another review should be scheduled. The LPP will be 50 years old in 1999. This would be an appropriate time for the next review.

## VIII CORRESPONDENCE

RUSSO/lc/7555

Mr. Jackson  
114-N

April 28, 1986

Planning Division  
Plan Formulation Branch

Honorable James Donchess  
Mayor of the City of Nashua  
City Hall  
Nashua, New Hampshire 03061

Dear Mayor Donchess:

I have initiated a review of the existing Nashua local flood protection project, completed by the Corps of Engineers in 1949. This project, like others we are studying in New England, was designed and constructed many years ago using design criteria in effect at that time. Our study will include a review of the adequacy of flood protection currently provided by the project, recent and possible future development in the watershed and new information in basin hydrology. We will also be looking for opportunities to make the project more viable, safe and reliable using current design standards.

Initially the study will be limited to a reconnaissance report which will evaluate the need for any modification to the completed project and determine whether there is a Federal interest in continuing the investigation. If warranted, I may recommend a follow-on feasibility study. During the feasibility study stage any modification plans will be formulated using current design criteria and screened from the standpoints of economics, environmental effects, engineering integrity and safety considerations. Items of local cooperation, both existing and those required for the future, will also be addressed if further action is recommended.

This study is not a substitute for the semi-annual inspections performed by my Operations Division personnel. Those inspections are conducted to ensure that the city is complying with the assurances of local cooperation signed by the city prior to construction of the Nashua project. This reconnaissance study will utilize previous semi-annual inspection reports and correspondence with the city as background information and will identify existing and potential problems previously observed which should be reviewed as part of this study. A member of my Planning Division staff will participate in the semi-annual inspection of the Nashua project on May 8, 1986.

Your comments are vital to our study. In the near future, a member of my staff will be contacting you, or a point of contact you appoint, to set up a meeting to discuss our study and hear your viewpoints. If you have any questions or comments, please do not hesitate to call me at (617) 647-8220. Mr. Robert Russo will be managing the study. He may be reached at (617) 647-8547.

Sincerely,

cc:  
Mr. Jackson ✓  
Reading File  
Plan Div Files

Thomas A. Rhen  
Colonel, Corps of Engineers  
Division Engineer

Public Works Division  
City Hall, Nashua, N.H. 03061

Division  
Director  
880-3325

Street & Sanitation  
Department  
880-3349

City  
Engineer  
880-3320

Park  
Department  
880-3346

*Lorraine  
Sander*  
Wastewater  
Treatment Plant  
880-3365



May 12, 1986

Thomas A. Rhen, Colonel  
Division Engineer  
Corps of Engineers  
424 Trapelo Road  
Waltham, MA 02254

Re: Your Letter - Mayor Donchess - April 28, 1986

Dear Colonel Rhen:

The Mayor has asked my office to be your point of contact for your study and review of the Nashua Flood Protection Project.

We are looking forward to hearing from you and your staff. Our phone number is (603) 880-3325.

Sincerely,

*L. Peter Benet*  
L. Peter Benet  
Director of Public Works

LPB:meh

May 15, 1986

Operations Division, Project Operations Branch

Honorable James Donchess  
Mayor of the City of Nashua  
Nashua, New Hampshire 03061

Dear Mayor Donchess:

My representatives conducted the semiannual inspection of the Federally built local flood protection project in Nashua on May 8, 1986. I have enclosed a detailed inspection report for your review.

The project is in satisfactory condition, capable of fulfilling its intended function. It was encouraging to hear that the removal of brush has been initiated and that all brush will be removed before the next inspection.

I want to thank Messrs. Dolbeare, Gagon, Hellshaw, Levesque and Ginot for their cooperation during the inspection. If you require any technical assistance in the operation and maintenance of your project, please call me at (617) 647-8411 or Jim Ward, Merrimack River Basin Manager at (603) 934-2673.

I am forwarding a copy of this letter and report to Mr. Donald Levesque, Asst. Supt. of Streets, Department of Public Works, City Hall, Nashua, NH 03061; Ms. Lorraine Sander, Supt., Waste Water Treatment, Department of Public Works, City Hall, Nashua, NH 03061; Mr. Delbert Downing, Chairman, Water Resources Board, 37 Pleasant Street, Concord, NH 03301.

Sincerely,

BM, MRB

Enclosure  
as stated

J. C. Wong  
Chief, Project Operations Branch

MANOR  
WONG

**Copy Furnished:**

**Mr. Donald Levesque  
Asst. Supt. of Street  
City Hall  
Nashua, NH 03061**

**Ms. Lorraine Sander  
Supt, Waste Water Treatment  
Department of Public Works  
City Hall  
Nashua, NH 03061**

**Mr. Delbert Downing  
Chairman, Water Resources Board  
37 Pleasant Street  
Concord, NH 03301**

**BM, MRB  
Ops. Div. Files**

# LOCAL FLOOD PROTECTION PROJECT INSPECTION REPORT

**Project:** FLOOD CONTROL PROJECT, NASHUA, NH

**Maintaining Agency:** City of Nashua, NH

**Type Inspection:**   X   Semi-Annual Staff        90 Day Interim

**River Basin:** Merrimack

**Date of Inspection** 8 May 1986

Feature	Sat	Unsat	Deficiencies
<b>PUMPING STATIONS - STRUCTURES</b>			
INTERIOR	X		
EXTERIOR	X		
<b>PUMPS - MOTORS - ENGINES</b>			
TRIAL OPERATED	X		Maintenance and operating logs needed
GENERAL CONDITION	X		
POWER SOURCE	X		
INSULATION TESTS	X		
METAL INTAKES/OUTLETS	X		
GATE VALVES	X		
<b>GATES - DRAINAGE STRUCTURES</b>			
TRIAL OPERATED	X		
GENERAL CONDITION	X		
LUBRICATION	X		
<b>DIKES - DAMS</b>			
GENERAL CONDITION	X		See Comment #1
SLOPES/EROSION		x	See Comment #2
SAND BOILS/CAVING	X		
TRESPASSING		x	See Comment #3
SLOPE PROTECTION	X		See Comment #4
DRAINS			
<b>STOP-LOGS - LOG BOOM</b>			
			N/A
CONDITION OF LOGS			
AVAILABILITY OF LOGS			
HIGHWAY SLOTS			
STORAGE FACILITIES			
<b>CHANNELS - OUTLET WORKS CHANNEL</b>			
			N/A
BANKS			
OBSTRUCTION CONTROL			

Feature	Sat	Unsat	Deficiencies
<b>CONCRETE STRUCTURES</b>			
SURFACE	X		
SETTLEMENT	X		
JOINTS	X		
DRAINS	X		
<b>MISCELLANEOUS</b>			
EMERGENCY OPER. PLAN	X		
EMERGENCY EQUIPMENT	X		
SEMI-ANNUAL REPORT			

**Inspection Party:** Mr. John Dolbeare, Maint. Foreman, Wastewater Treatment Plant  
 Mr. Richard Gogion, Wastewater Treatment Plant  
 Mr. Timothy Hellshaw, Wastewater Treatment Plant  
 Mr. Donald Levesque, Asst. Supt of Streets  
 Mr. Robert Ginot, Foreman, Parks Dept.  
 Mr. Robert Russo, NED Planning  
 Mr. Brain Parsons, NED  
 Mr. Charles Joyce, NED

**Photographs Taken:** Mr. J.A. Ward, Basin Manager, MRB

None

### Remarks & Additional Comments:

( Indicate Here Observations, Discussions, Specific Feature Deficiencies, Recommendations and any other pertinent information.  
 Use Continuation Sheet if necessary.)

Comment #1 - Brush has been cut under bridges but brush still needs to be cut along dikes.

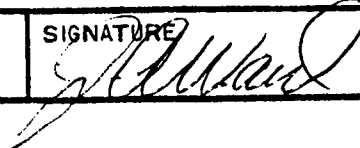
Comment #2 - All efforts should continue to discourage ATV use.

Comment #3 - The encroachment by Coatings Systems Inc. as reported in the last four inspection reports will be checked into at Nashua City Hall by Mr. Levesque. A follow up report has been requested.

The trailer owned by Independence Boat Club has been removed for the area.

Comment #4 - Area of dike still posted by EPA/Asbestos Waste Site.

X ALL APPLICABLE ITEMS. IF UNSAT INDICATE SPECIFIC DEFICIENCIES. INDICATE IF NOT APPLICABLE.

DATE 5/9/86	INSPECTED BY: TYPED NAME & TITLE J.A. Ward, Basin Manager, MRB	SIGNATURE 
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DEPARTMENT OF THE ARMY  
NEW ENGLAND DIVISION, CORPS OF ENGINEERS  
424 TRAPELO ROAD  
WALTHAM, MASSACHUSETTS 02254-9149

REPLY TO  
ATTENTION OF

February 28, 1986

Operations Division, Project Operations Branch

*Jim will straighten  
this out*

Honorable James Donchess  
Mayor of the City of Nashua  
Nashua, New Hampshire 03061

Dear Mayor Donchess,

Reference to our recent letter requesting that you complete a new Designation of Superintendent form. It is important for us to have an up to date listing of the individuals who are responsible for the operation and maintenance of the projects. In the event of an emergency, much valuable time can be saved when contact is made with the right individual.

We request that the attached form be completed and returned to this office as soon as possible. If you have any questions, you can reach me at 617-647-8411.

Sincerely

*J. C. Wong*  
J. C. WONG

Chief, Project Operations Branch

*Peter -  
Can you take  
this one?*

*Joe T.*

*Sent  
1/3/86  
attached  
are copies -*



REPLY TO  
ATTENTION OF

DEPARTMENT OF THE ARMY  
NEW ENGLAND DIVISION, CORPS OF ENGINEERS  
424 TRAPELO ROAD  
WALTHAM, MASSACHUSETTS 02154-9149

OPERATIONS DIVISION, PROJECT OPERATIONS BRANCH

DESIGNATION OF SUPERINTENDENT

NAME OF PROJECT: Flood Protection Project

LOCATION: Nashua, N.H.

MAINTAINING MUNICIPAL AGENCY:

AGENCY: Division of Public Works

ADDRESS: City Hall, Main St. Nashua, N.H. 03061 TEL. NO. 603 880-3325

"SUPERINTENDENT" - (as required by Section 208.10 (A)(2), Chap II, Title 33)

NAME & TITLE: Preston Yerrington - Superintendent of Streets

EMPLOYED BY: Division of Public Works - Nashua, N.H.

BUSINESS ADDRESS: Riverside Drive - Nashua, N.H.

BUSINESS TEL. NO: 603 880-3347

NIGHTS, SUNDAYS, ADDRESS: N/A 24 hour Watch/Dispatcher

NIGHTS, SUNDAYS, TEL. NO: 603- 880-3347

REMARKS:

SIGNED *P. Yerrington*

TITLE Director of Public Works

DATE 1/3/86



REPLY TO  
ATTENTION 402

DEPARTMENT OF THE ARMY  
NEW ENGLAND DIVISION, CORPS OF ENGINEERS  
424 TRAPELO ROAD  
WALTHAM, MASSACHUSETTS 02154-9149

OPERATIONS DIVISION, PROJECT OPERATIONS BRANCH

DESIGNATION OF SUPERINTENDENT

NAME OF PROJECT: Flood Protection Project

LOCATION: Nashua, N.H.

MAINTAINING MUNICIPAL AGENCY:

AGENCY: Division of Public Works

ADDRESS: City Hall, Main St, Nashua, N.H. 03061 TEL. NO. (603)880-3325

"SUPERINTENDENT" - (as required by Section 208.10 (A)(2), Chap II, Title 33)

NAME & TITLE: Lorraine Sander - Superintendent Treatment Plant

EMPLOYED BY: Division of Public Works - Nashua, N.H.

BUSINESS ADDRESS: Sawmill Road - Nashua, N.H.

BUSINESS TEL. NO: 603 880-3365

NIGHTS, SUNDAYS, ADDRESS: N/A - 24 hour Watchman/Operator

NIGHTS, SUNDAYS, TEL. NO: 603-880-3365

REMARKS:

SIGNED *F. P. B. Burt*

TITLE Director of Public Works

DATE 1/3/86



DEPARTMENT OF THE ARMY  
NEW ENGLAND DIVISION, CORPS OF ENGINEERS  
424 TRAPELO ROAD  
WALTHAM, MASSACHUSETTS 02254-9149

REPLY TO  
ATTENTION OF

OPERATIONS DIVISION, PROJECT OPERATIONS BRANCH

DESIGNATION OF SUPERINTENDENT

NAME OF PROJECT: Flood Protection Project

LOCATION: Nashua, N.H.

MAINTAINING MUNICIPAL AGENCY:

AGENCY: Division of Public Works

ADDRESS: City Hall, Main St. - Nashua, N.H. 03061 TEL. NO. 880-3325 (603)

"SUPERINTENDENT" - (as required by Section 208.10 (A)(2), Chap II, Title 33)

NAME & TITLE: Frank Dorsey - Superintendent Parks

EMPLOYED BY: Division of Public Works - Nashua, N.H.

BUSINESS ADDRESS: Greeley Park, Concord St. - Nashua, N.H.

BUSINESS TEL. NO: 880-3346

NIGHTS, SUNDAYS, ADDRESS: N/A - Street Department - 24 Hrs Watchman/Dispatcher

NIGHTS, SUNDAYS, TEL. NO: 880-3347

REMARKS:

SIGNED *L. C. Taylor*

TITLE Director of Public Works

DATE 1/3/86

Public Works Division  
City Hall, Nashua, N.H. 03061



Division  
Director  
880-3325

Street & Sanitation  
Department  
880-3349

City  
Engineer  
880-3320

Park  
Department  
880-3346

Wastewater  
Treatment Plant  
880-3365

June 16, 1986

Mr. J. C. Wong  
Chief, Project Operations Branch  
New England Division, Corps of Engineers  
424 Trapelo Road  
Waltham, Massachusetts 02254-9149

Dear Mr. Wong:

I have been in contact with Coating systems, Inc., and they have indicated that the disturbed area next to the Dike on their property will be restored in the immediate future, such that there should be no breakdown in the basic integrity of the Dike.

It is their claim that the area that appeared to be disturbed, is simply excavated material place on the edge of the Dike, and that the Dike itself has not been disturbed.

Once the area is cleaned up there should be no problem. We will monitor the situation accordingly.

Your concern is appreciated.

Very truly yours,

L. Peter Benet  
Director of Public Works

LPB:meb

CITY ENGINEER

City of Nashua  
229 Main Street  
Nashua, New Hampshire 03061-2019

603/880-3320



June 4, 1986

Mr. Robert Russo, Project Engineer  
Planning Division  
U.S. Army Corps of Engineers  
424 Trapelo Road  
Waltham, Ma 02254-9149

Re: Flood Control - Dike

Dear Sir:

As requested of Deputy City Engineer Morrill, please find enclosed a copy of our sewer record drawings for Bridge, East Hollis and Crown Streets and zerox copies of the North Merrimack I Interceptor Record Drawings which interconnects with all of the above mentioned sewers.

If we can be of any further help to you in this regard, please do not hesitate to call Mr. Morrill at 880-3321.

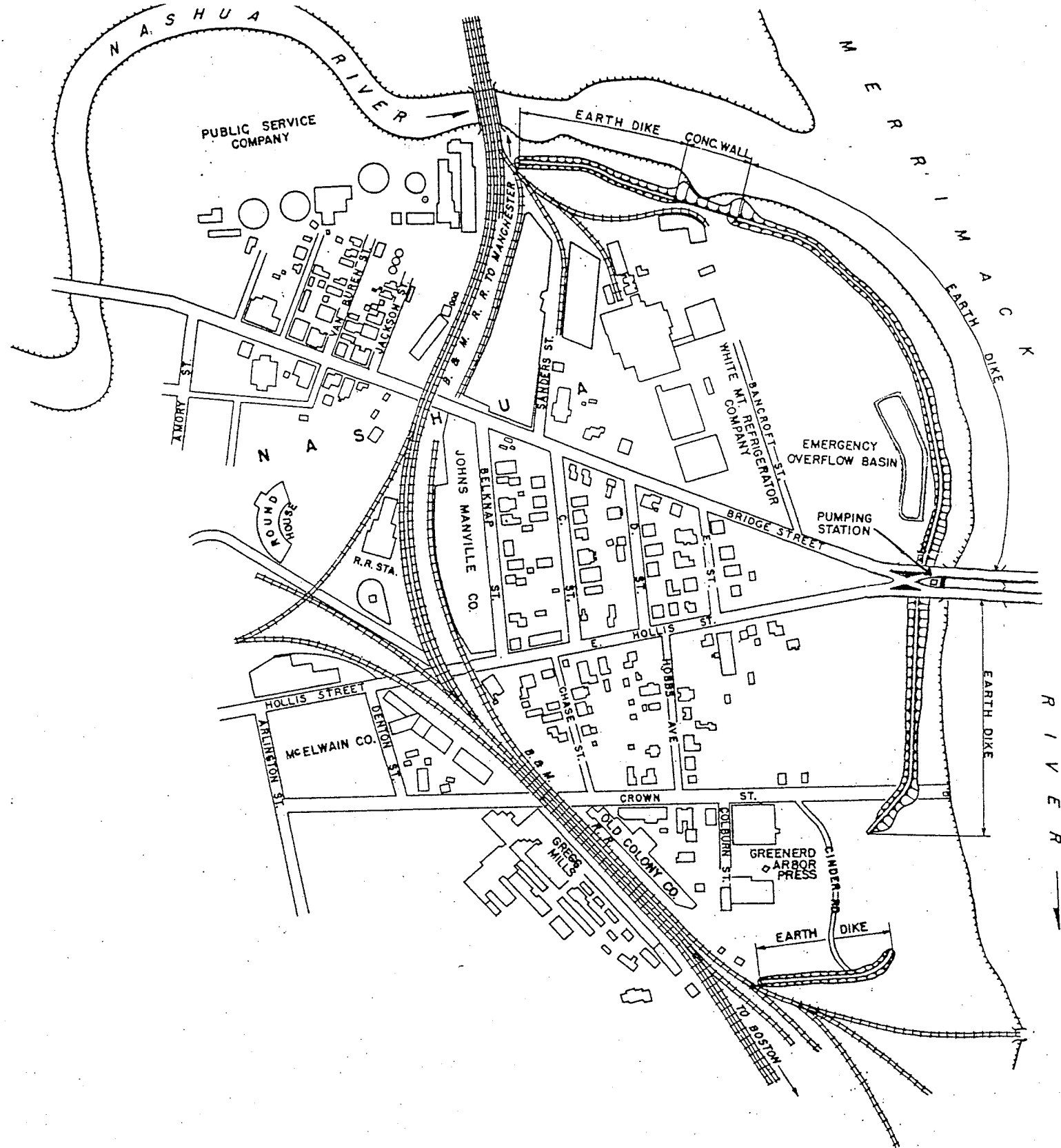
Very truly yours,

A handwritten signature in cursive script, appearing to read "James F. Hogan".

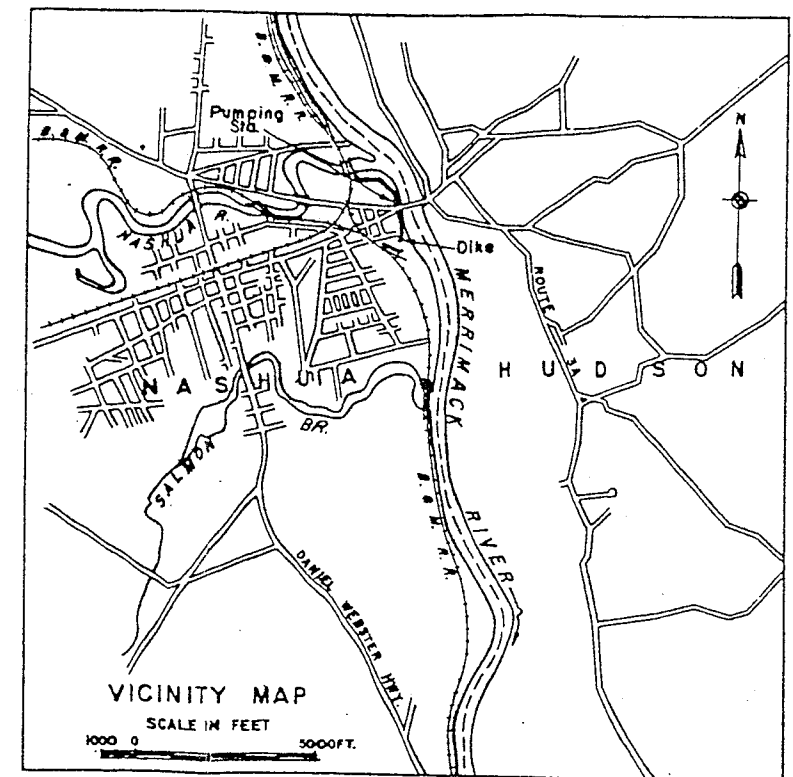
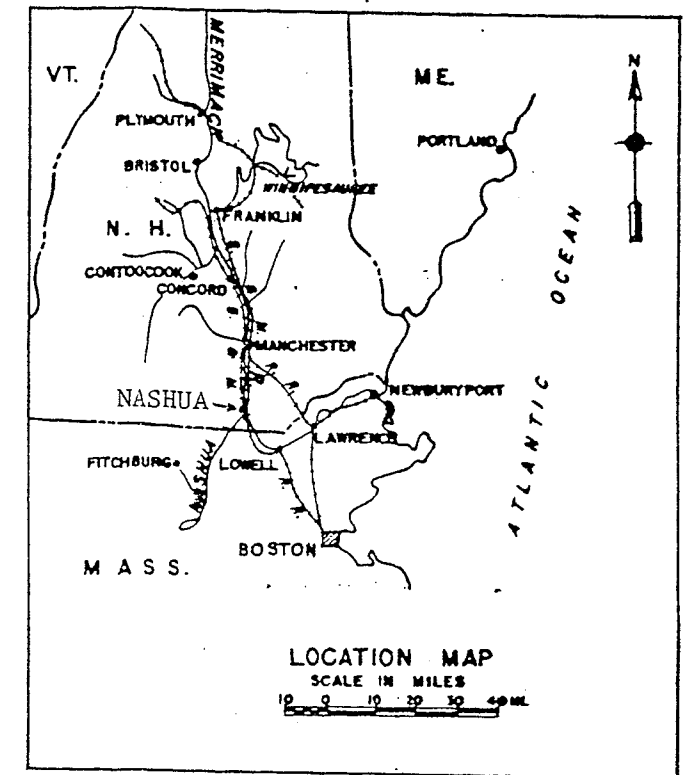
James F. Hogan  
City Engineer

JM:meh

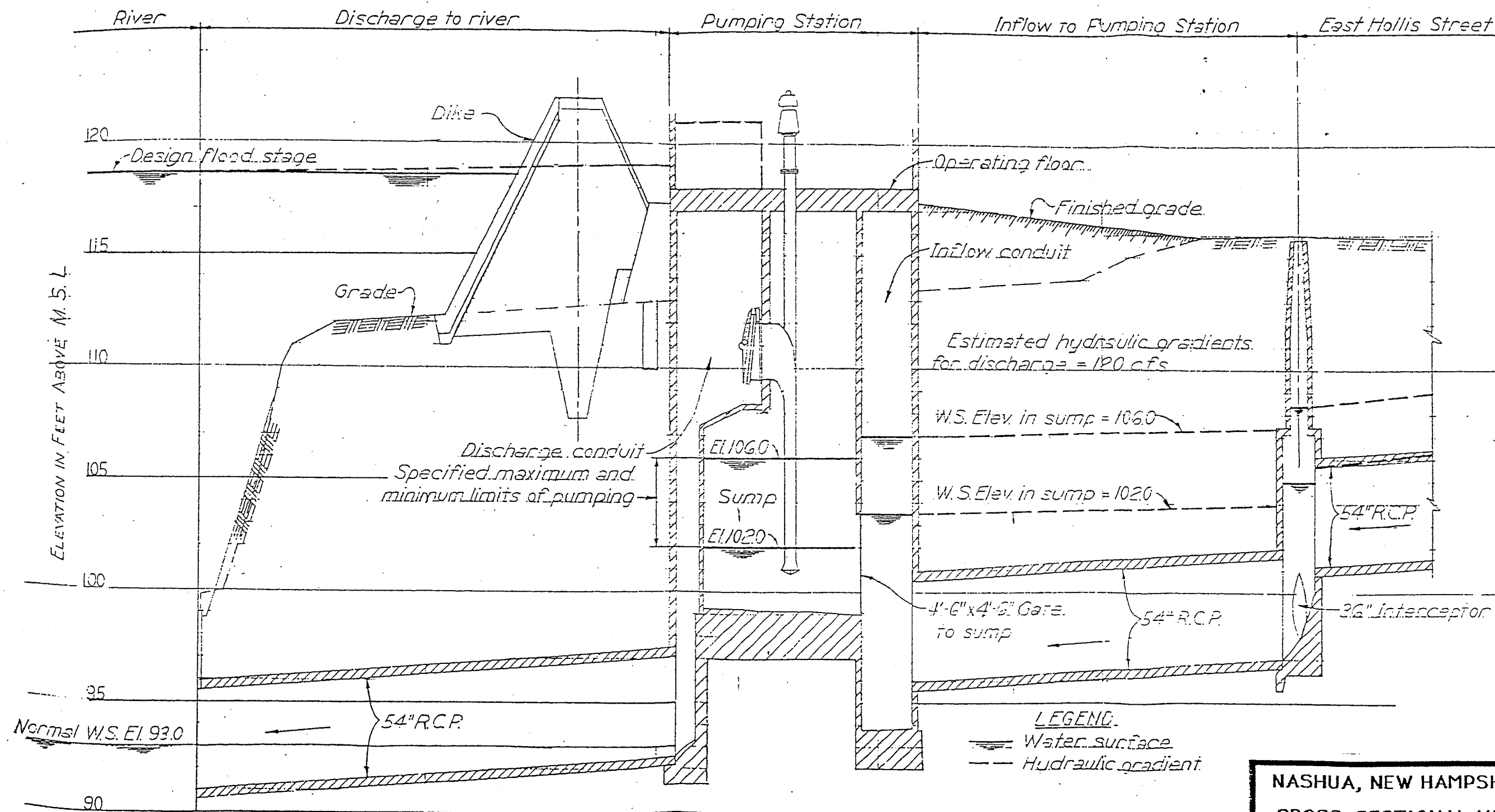
cc: L. Peter Benet - Dir of Public Works



SCALE IN FEET  
200 0 200 400 600

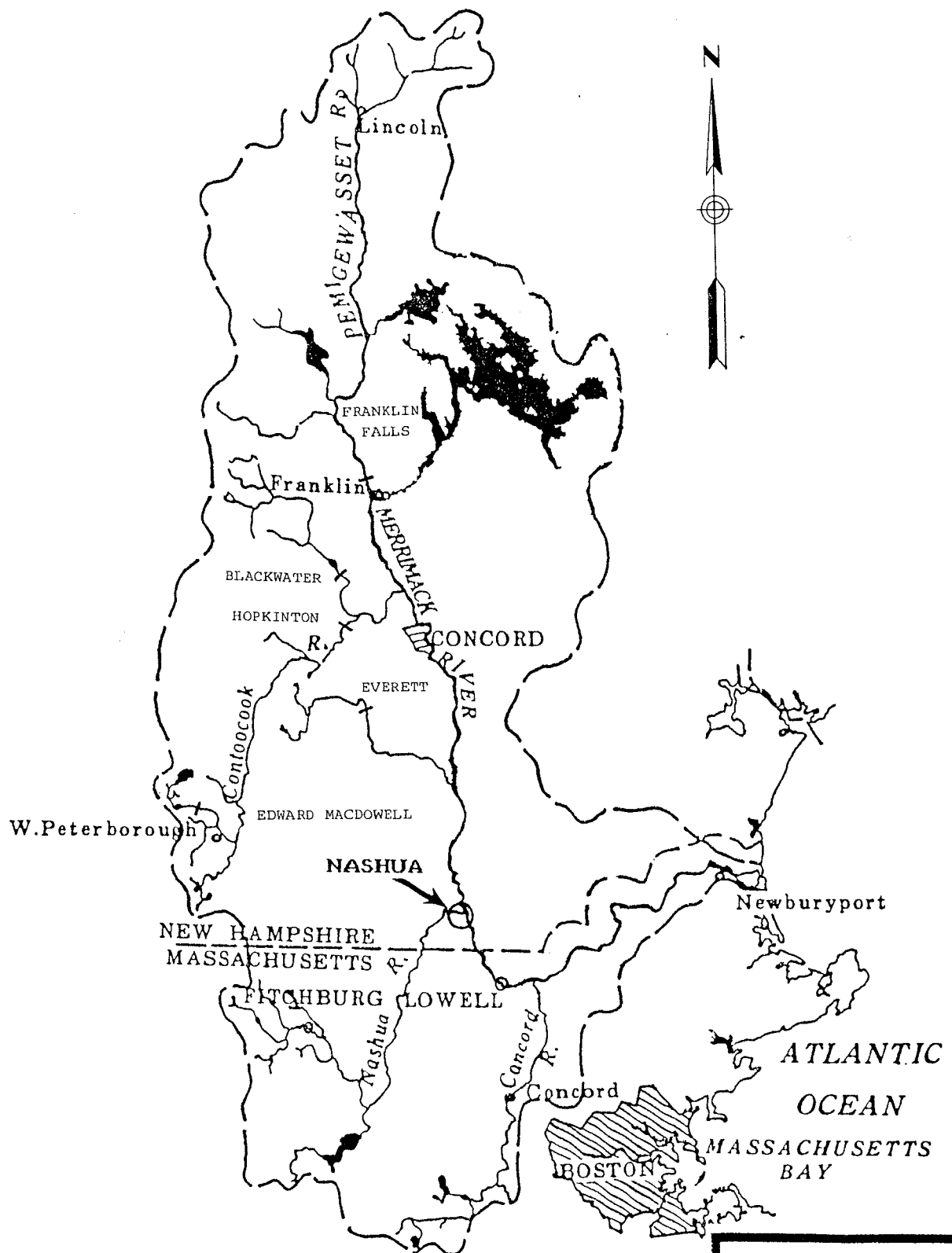


FLOOD PROTECTION WORKS  
NASHUA, NEW HAMPSHIRE  
PROJECT MAP



**NASHUA, NEW HAMPSHIRE**  
**CROSS-SECTIONAL VIEW**  
 of  
**DIKE**



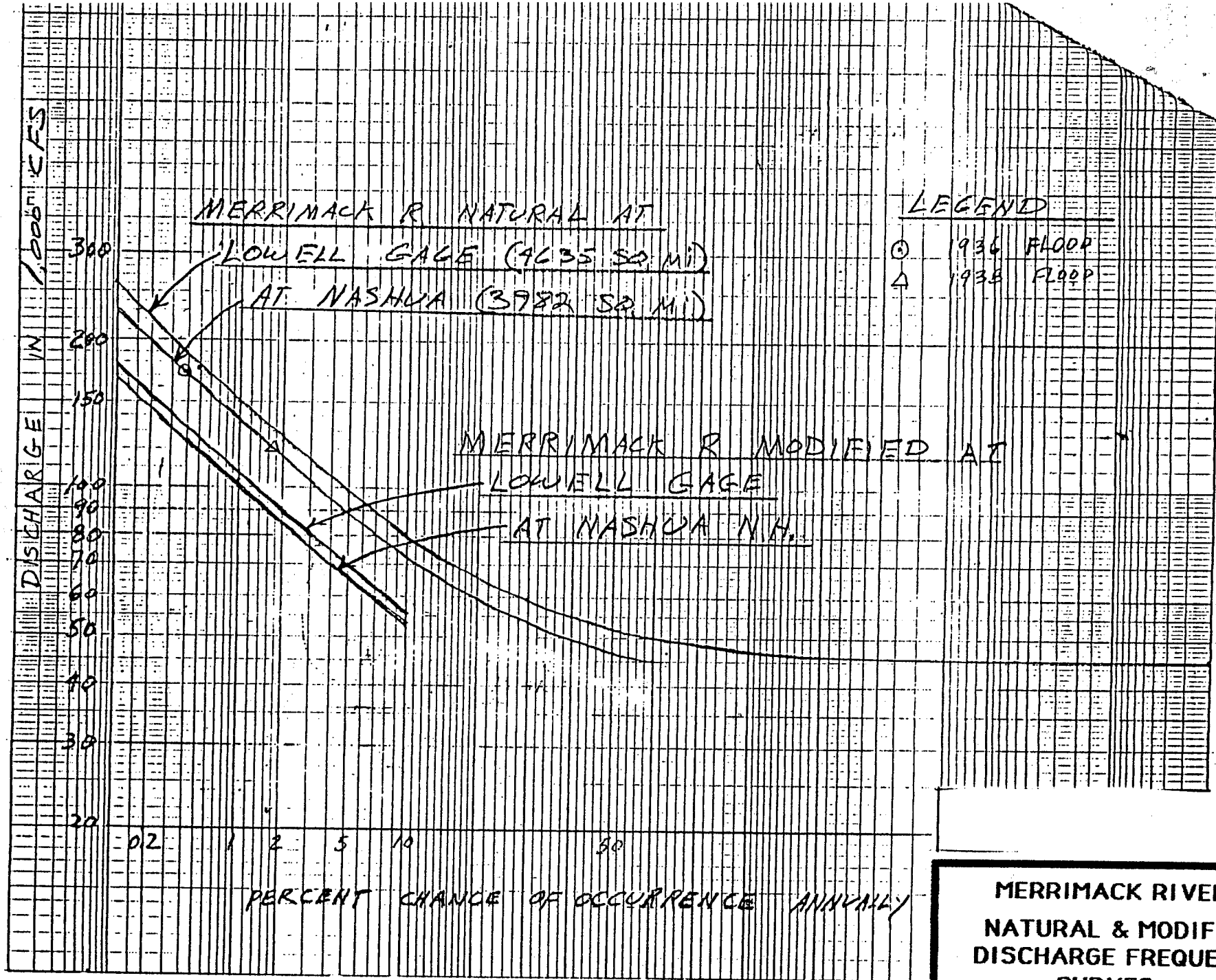


MERRIMACK RIVER BASIN

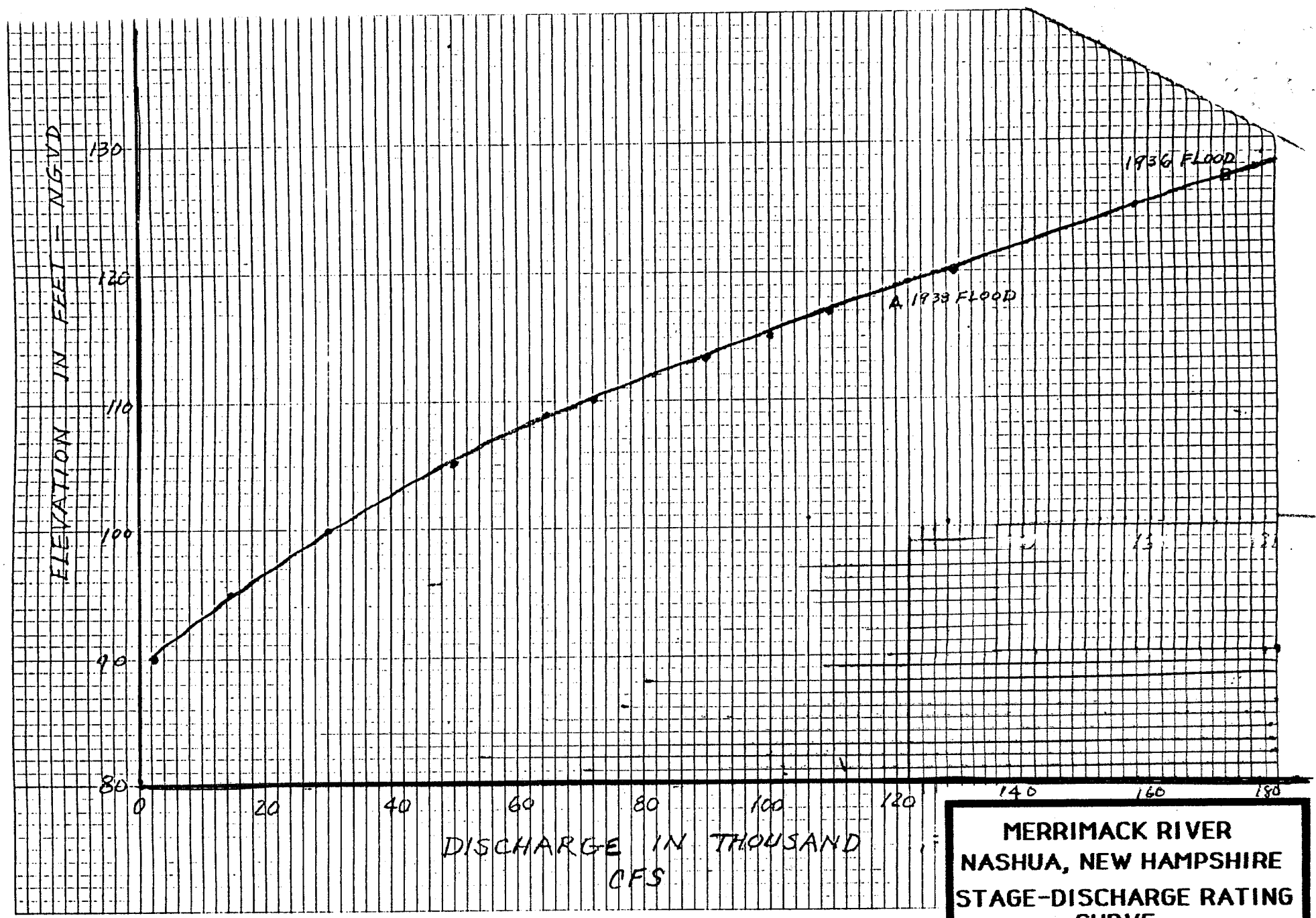
MERRIMACK RIVER  
BASIN MAP

SEPTEMBER 1986

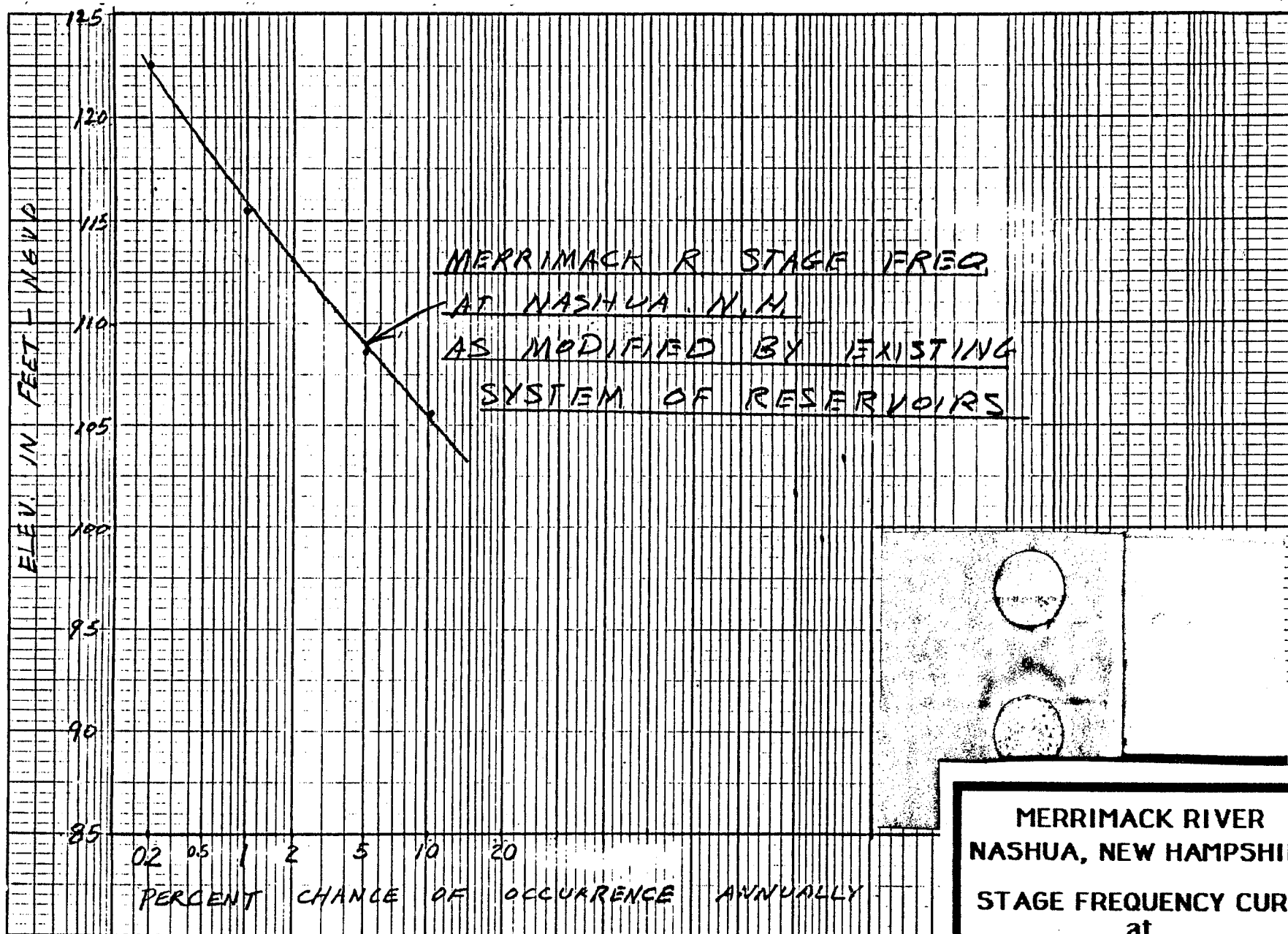
PLATE 3



**MERRIMACK RIVER  
 NATURAL & MODIFIED  
 DISCHARGE FREQUENCY  
 CURVES  
 JUNE 1986**

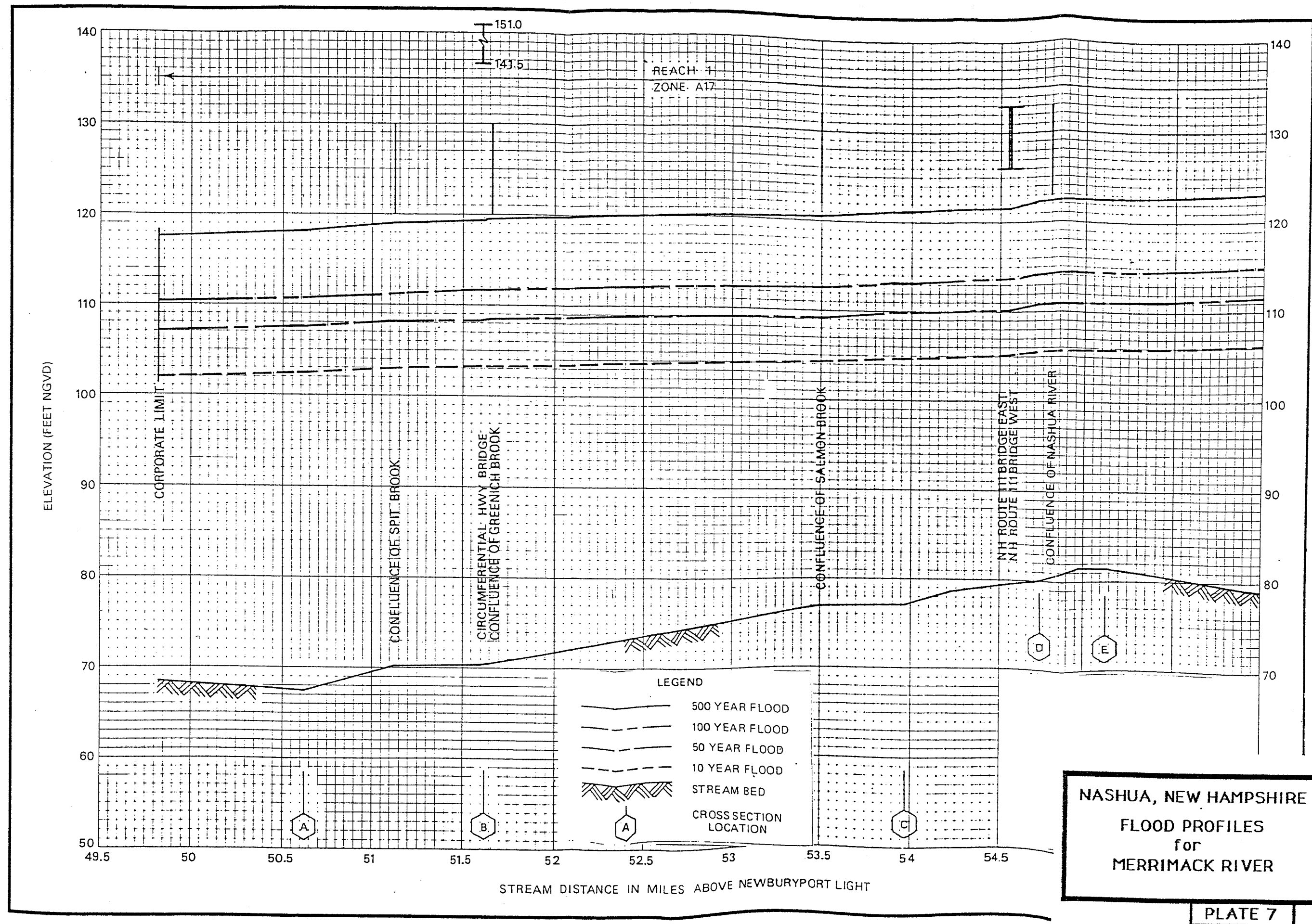


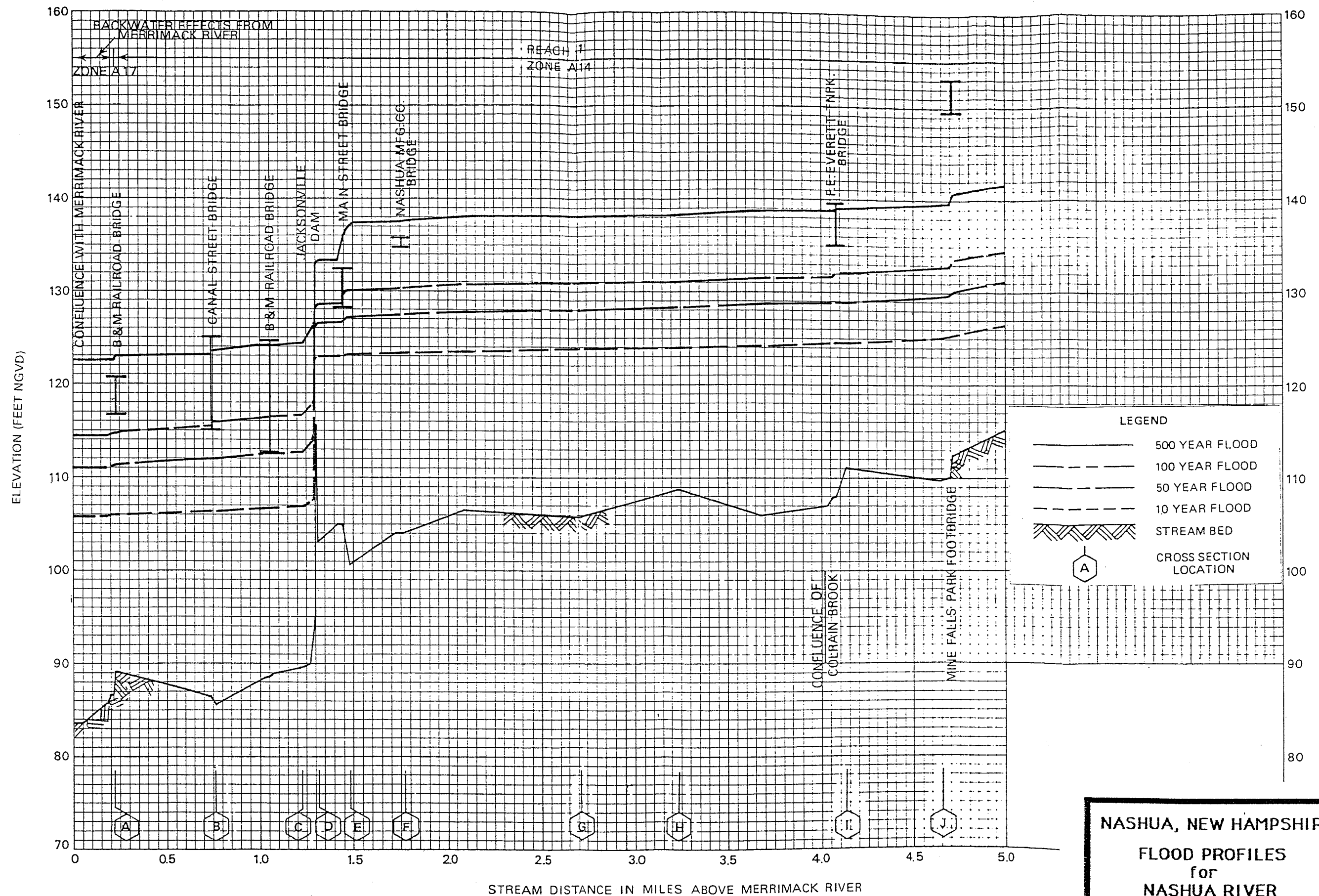
**MERRIMACK RIVER  
NASHUA, NEW HAMPSHIRE  
STAGE-DISCHARGE RATING  
CURVE  
at  
NASHUA-HUDSON BRIDGE  
JUNE 1986**



**MERRIMACK RIVER  
 NASHUA, NEW HAMPSHIRE  
 STAGE FREQUENCY CURVE  
 at  
 ROUTE 111 BRIDGE**

**MAY 1986**





NASHUA, NEW HAMPSHIRE  
 FLOOD PROFILES  
 for  
 NASHUA RIVER